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ABSTRACT

This paper shows how gender, science, and assessment are all built on a fundamental set of dualistic concepts associated with masculine power and privilege. It also shows that a manageable change to curriculum, instruction, and assessment practices, moving from the conventional masculine paradigm of "quality" practice to a reconstructed perspective incorporating the feminine side of the dualisms, has an immediate and dramatic impact on historical achievement profiles. In this study, about 5,000 physics students in grade 12 in Victoria (Australia), have undertaken new assessment processes in physics for university selection, and it has been found that girls have suddenly become brilliant at physics. Changing assessment protocols has an immediate impact on the success of girls in physics. This pattern has been retained over a 5-year period with the new curriculum and assessment practices, and it follows a 20-year plus period when it was assumed that boys were just "naturally" better at physics than girls. Tools from post-structural feminism are used to explore "both/and" notions - in lieu of common "either/or" conceptions - of the gendered binaries that underpin assessment, and hence to reconstruct and explain this positive effect on achievement profiles. (Contains 2 tables and 68 references.) (Author/SLD)

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Re/Constructing gendered achievement profiles.

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Paper presented as part of the symposium
Deconstructing Patriarchy in Schools: Curriculum, Practice, and Policy
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April, 1998, San Diego.

ABSTRACT:

Because assessment is frequently the engine that drives curriculum and instruction, it has the power to endorse or to challenge the ways in which fields of knowledge, school subjects and understandings about learning, achievement and gender are constructed through the delivered curriculum. This section of the symposium shows how gender, science and assessment are all built on a fundamental set of dualistic concepts associated with masculine power and privilege. Optimistically, it also shows that a manageable change to curriculum, instruction and assessment practices - moving from the conventional masculine paradigm of "quality" practice to a re-constructed perspective incorporating the feminine side of the dualisms - has an immediate and dramatic impact on historical achievement profiles. In this study, about 5000 physics students in grade twelve, Victoria, Australia, have undertaken new assessment processes in physics for university selection, and it is found that girls have suddenly become brilliant at physics. Changing assessment protocols had an immediate impact on the success of girls in physics. This pattern has been retained over a five year period of the new curriculum and assessment practices and follows a 20-plus year period when it was assumed that boys were just "naturally" better at physics than girls. Tools from post-structural feminism are used to explore "both/and" notions - in lieu of common "either/or" conceptions - of the gendered binaries that underpin assessment, and hence to re/construct and explain this positive effect on achievement profiles.

Assessment is frequently the engine that drives the curriculum and instructional practices. Hence assessment has the power to endorse or to challenge the ways in which fields of knowledge, school subjects and understandings about learning and about gender are constructed through the delivered curriculum. This paper shows how gender, science and assessment are all built on a fundamental set of dualistic concepts associated with power and privilege, and goes on to tell the story of a challenge, and a consequent interruption, to the construction of achievement in physics undertaken in the state of Victoria, Australia. By transforming assessment practices it became possible to change both what was taught and how it was taught and this has altered the historical achievement profile so that girls have suddenly become brilliant at physics.

Gendered achievement profiles which exist in many subject areas of the school curriculum have been partly built up by assessment techniques which have privileged some masculine constructions of knowledge and ways of knowing (Belenky et al, 1986). By this, I mean that those bodies of knowledge, skills and experiences that have been more highly regarded within many subject areas, indeed more richly rewarded within our culture, have been traditionally defined as those associated with hegemonic masculinity (Connell, 1987).

> To invoke the importance of pedagogy is to raise questions not simply about how students learn but also how educators ... construct the ideological and political positions from which they speak. (Henry Giroux, 1992, p. 81)

To uncritically perpetuate practices implicitly underpinned by an ideology that privileges the masculine is to jeopardise work towards effective curriculum and instruction for all students. I use a post-structural feminist perspective, where dualisms and discourses are used as sources of critique and challenge (Weedon, 1987) and multiple subjectivities are acknowledged, to turn the "either/or" dualisms of assessment into "both/and" concepts which then produce a more gender equitable outcome.

There are many facets to a gender inclusive curriculum. A schema of facets which indicates the multiple factors which interact to construct gender in schools includes: the life experiences which students and teachers bring to school; the organisational structure of the curriculum; the constructions of knowledge inferred by the way the curriculum is devised and taught; the power differential associated with communication and decision-making patterns; the degree to which the learning process is student-driven and negotiated; the ideologies about pedagogy held by teachers; the practical strategies used for instructional purposes; the degree of social context and theory-practice links in the content of the curriculum and the integration or separateness of its components; resource availability and utilisation; the

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degree of integration of work education into the curriculum; the physical environment; the ways sex-based harassment is dealt with; and assessment practices (see Allard et al, 1995, p. 81-2).

Also, the particular school context within which the curriculum sits alters its interpretation because the outcomes of any interventions depend on the circumstances (students and context). Particular facets of the curriculum will produce a focus of energy and attention at different times (no teacher can alter all the above facets at any one time); but the better outcomes of intervention will come from multiple sites of action. This paper only highlights the facet of curriculum related to assessment-driven profiles of achievement and recognises that no single dimension, alone, can transform the outcomes of schooling for all girls and women.

Linking constructions of gender, science and assessment

It is now widely acknowledged that gender is a social construction and that understandings about 'appropriate' versions of femininity and masculinity 'vary across different cultures; are informed by social class; and change over time both individually and collectively. They can be endorsed, negotiated, challenged, reconstructed and resisted on an individual and collective basis.' (Allard et al, 1995, p. 21) Whilst we have some agency to choose or resist gendered practices and codes, particular constructions of masculinity and femininity are accorded higher status.

Hegemonic masculinity is the 'culturally exalted' version (Connell, 1995, p. 77) which is publicly admired, rewarded and aligned with hierarchical power, objectivity and competition. 'Emphasised femininity', an unequal opposite (Connell, 1987, p. 183) is the traditional form where there is a compliance with the subordination of women to men, a focus on physical appearance and a narrow range of life options centred on the private realm. Emphasised femininity is aligned with emotions, subjectivity and cooperation and its asymmetry with hegemonic masculinity is played out in both institutional and interpersonal spheres.

There have been many critiques of science which have revealed its social construction (e.g. Sandra Harding, 1986, 1991; Bleier, 1986; Tuana, 1989; Rosser, 1990; Lemke, 1990; Thomas, 1990; Code, 1991; Kirkup and Keller, 1992; Shepherd, 1993). These analyses have revealed the masculine bias in the practice of science, in the image of science and in the way dimensions have been selected for inclusion in school studies. Many factors in the dominant paradigm of 'good' or 'real' science, aligned with those defining hegemonic masculinity, are so deeply embedded in our understanding of what science is that they have become invisible. The branch of science called physics, has been socially constructed this century to link directly with power and control through militarism, and thus more closely to hegemonic masculinity than most other fields.

The status accorded science has influenced knowledge production and authentication in many other fields and the positivist paradigm, which science has created and cultivated has, in turn, strongly influenced research methodologies across many fields, including educational evaluation (e.g. Lincoln and Guba, 1985; Lather, 1991; Reinharz, 1992). Through its grounding in psychometrics, with its heavy reliance on positivism, assessment of achievement in education is also a construction linked directly to hegemonic masculinity.

All three of these constructions - gender, science and assessment - are based on a common set of asymmetrical dualisms where the concepts in the left column are valorised, taken as the norm and used as the measuring stick of worth.

abstract	holistic
quantitative	qualitative
outcomes	process
competition	cooperation
objective	subjective
knower/mind	knowable/Nature
hierarchical	multiplicity
value-free	value-laden

The concepts in the right column are associated with the 'other' (not the norm), are of lower status and represent a supposed inherent inferiority. These asymmetrical dualisms thus create implicit assumptions about (hegemonic) masculinity and (emphasised) femininity; about science and non-science; and about so-called 'good' and 'bad' assessment practices.

Some people would look through a liberal feminist lens, and see the challenge as fixing the girls, science and assessment practices so that they fit the conceptual model built by the left column, taking the 'malestream' (O'Brien, 1981) as the standard. Others would draw on radical feminist notions and focus on the strengths of the feminine (right) column in an attempt to bring that into a symmetrical balance with the left column - equally valuing both concepts in each dualism. But I use a post-structural feminist set of lenses to contest these dualisms by asking provocative questions such as: Are they dualisms or continua? Whose purpose is being served by the valuing of one set over the other? Would the multiple truths generated by using 'both/and', rather than 'either/or', produce a more acceptable reality?

I will now explore how these dualistic concepts distort science and assessment. The dysfunctional processes and outcomes arising from the dualisms that produce hegemonic masculinity and emphasised femininity permeate feminist thought and will not be further discussed here.

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Gendered dualisms and science

The image of science is strongly gendered and aligned with hegemonic masculinity (e.g. S. Harding, 1986; Tuana, 1989; Thomas, 1990; Kirkup and Keller, 1992) but this mystique is a distortion of the concealed reality which frequently accommodates concepts from the right column of dualisms.

Linda Shepherd (1993) reveals the existing, but heavily veiled, feminine face of science that includes:
• knower/known interactivity: Heisenberg's Uncertainty Principle in physics (you cannot measure both the momentum and the position of an electron because in measuring one you interfere with the other) along with Chaos Theory reveal the interdependence of the observer and the observed;
• subjectivity: feelings are significant when research is motivated by love and desire, where hunches come before hypotheses, and where research methodologies are deliberately chosen to illuminate the study in the most favourable light;
• multiplicity: a web of interactivity exists between and among all phenomena, with Complexity Theory being a recognition of this phenomenon;
• cooperation: the importance of care and empathy in sustaining an harmoniously working research team, and in participant willingness to being the "researched" in the social sciences;
• intuition: another way of knowing which is valued in highly esteemed, speculative scientists; and
• holistic: seeing the relatedness of ideas through interdisciplinary studies which show larger patterns, challenges underlying values like simplicity, abstraction and reductionism in science.

She argues that only when science integrates the feminine with the masculine, and replaces "either/or" conceptualizations with "both/and" thinking, will there be an acceptance of the complexities of reality.

Yet, as Jay Lemke shows school science further distorts the field of science by:
• generating a catalogue of 'facts' for students to recall and presenting science as if it is possible to produce absolutely objective truths;
• pretending that a scientific method exists - even when we know that real scientists, funded through politically-driven sources, seek evidence through using the research techniques that will most likely provide what they desire;
• teaching with the expectation that only a 'super-intelligent elite' can ever understand science's concepts; and thus teaching most students to trust powerful technocrats and politicians who make decisions based on scientific, and hence unchallengeable, evidence. (Lemke, 1990)

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Gendered dualisms and assessment

For each pair of gendered dualisms, looking through the post-structural feminist lens enables us to challenge the 'either/or' assumptions that value the dominant paradigm, allowing us to see that 'both/and' notions can lead to a more equitable view of assessment.

Reward holistic learning
(both abstract and holistic)

Assessment has largely valued abstraction and analysis over holism, relatedness and synthesis, particularly in science where the real world is often seen as too 'messy' and complex to illustrate with neat mathematical models. If our assessment procedures only examine students' ability to suspend what they know about their world, while they blindly manipulate formulae or regurgitate information, then we ought not be disappointed when students fail to apply concepts to the real world.

> Ensuring science and technology are considered in their social context with assessment of their benefits for the environment and human beings may be the most important change that can be made in science teaching for all people, both male and female. (Rosser, 1990, p. 72)

Anecdotal evidence suggests that many girls do prefer to learn concepts situated in their social context rather than abstract, fragment and compartmentalise their understandings. To value holistic learning, assessment tasks ought to be set within a social context and reward synthesis of ideas where theory and practice are clearly interconnected.

Encourage qualitative understanding
(both quantitative and qualitative)

Testing the authenticity of a proposed assessment task by checking whether it seeks evidence of qualitative understanding, rather than simplistic manipulation of quantitative data, is one way to recognise that many girls strive for this. For example:

> My curiosity simply did not extend to the quantitative solution. I just didn't care to figure out how much. I was more concerned with the 'why' and the 'how'. I wanted verbal explanations with formulae and computations only as a secondary aid. Becoming capable at problem solving was not a major goal of mine. But it was a major goal of the course. (Michelle in Tobias, 1990, p. 40)

There is considerable anecdotal evidence from teachers which suggests that girls are more troubled by a feeling that they 'don't really understand', an important factor in their withdrawal from subjects/courses. Boys appear to be less concerned by this and will

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continue a subject when their grades indicate that they 'know enough'. If we value deep understanding then we should be build it into our assessment processes. Also, many students, frequently girls, want feedback on their work that goes beyond a quantitative grade. As assessors of student achievement we need to provide extended oral and written feedback that helpfully indicates areas of success whilst specifying ways in which the quality of work can be improved.

The means effects the ends
(both outcomes and process)

A narrow focus on outcomes, products and endpoints leads to a tendency to rely on summative assessment modes that are too late for student action. Judgments should be based on a rich record of student progress, which is built up over time and which gives due recognition to an ongoing commitment to attend to their work, as many girls do. Paul Black concluded from his comprehensive review of formative and summative assessment that 'good formative assessment can be a powerful tool for raising standards of learning' (Black, 1993, p. 84) and that it ought to be 'embedded' into, and support, learning programs.

Integrated formative assessment has the potential to monitor a range of competencies meeting all the course goals. Many courses aim to cover multiple aspects of learning, such as: knowledge; skills (including communication, thinking, problem solving and social); values (including attitudes, ethics and morality); and metacognition (learning how to learn). Those things that are easiest to summatively assess should not take precedence over those tasks which encourage the full spectrum of intended learning outcomes. Unless all curriculum goals are built into the assessment processes they will be read as unimportant; for example, many girls do well in research and cooperation which are not valued when they are not assessed.

Intrinsic motivation through explicit guidelines
(Both competition and cooperation)

The extent to which we have indoctrinated our students into competitive assessment can be roughly gauged by the number of times we hear the question: 'What did you get?' Assuming that all students are extrinsically motivated by competition pitches the students in a battle against the assessor and against each other. Norm-referencing builds in competition through its winners and losers system, but assessment 'should be essentially criterion-based rather than norm-based' (Australian Curriculum Studies Association, 1992, p. 37) to create the possibility of all students being winners.

Many teachers argue that girls are more focused than boys in trying to 'guess what's in the teacher's head' and in their desire to meet expectations. Also, those students whose learning is undermined by

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blatant competition, with its frequently shifting or unclear benchmarks, can be highly motivated by the intrinsic pleasure in understanding and in completing assigned tasks. To remove some of the guesswork and competition, teachers and assessors could co-operate with students by providing clear guidelines and criteria for evaluating student work. Also, many girls like to work jointly on projects and assessment processes should provide ways to reward such cooperation which, after all, is highly valued in the workplace.

Explicit guidelines specifying achievable, yet challenging, work requirements and assessment tasks should include:
- topic or theme of the learning area;
- process tasks or work requirements;
- product types and formats to be completed;
- product extent or length;
- time-lines (including interim and final dates);
- the criteria which will be used to judge the quality of work; and
- the weighting of each task in the overall assessment package.

Recognising the pervasiveness of subjectivity
(both objective and subjective)

Traditional assessment practices, drawn from and located within the positivist, psychometric paradigm, have assumed that it is possible to build in total objectivity, as well as validity and reliability, and that these are simply technical problems for assessment designers. Lorraine Code (1991) asks 'Out of whose subjectivity has this ideal [of objectivity] grown? ... whose values does it represent?' (p.70) She contends that we can be neither value-free nor value-neutral because of the subjectivities interwoven in the knower/assessor such as: their location in history and in specific social and linguistic contexts; their racial, ethnic, political, class, age and other identifications; their enthusiasms, desires, commitments and interests; and hence their value system (Code, 1991, p.46).

Thus, '... all assessment is a human and subjective process' (Withers and Cornish, 1984, p. 3). Even so-called objective tests (usually multiple choice items) involve subjective judgments about: the choice of language used; the contexts deemed appropriate; the distinctions used to define the distracters; and in the selection process used to determine which items to include on a particular test.

The questions that must be raised concerning objectivity and lack of precision have been masked by an over-reliance on numbers as represented by 'marks'. This association of numbers with truth, a feature of the positivist paradigm, has been critiqued by many researchers (e.g. Lather, 1991; Code, 1991; Shepard, 1992; Gipps, 1994; Gipps and Murphy, 1994) and assessment must be recognised as an 'inexact process which involves varying degrees of errors both in measurement and in judgement' (Australian Curriculum Studies Association, 1992, p.38).

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Responsive evaluation, which recognises the complexities of constructivism and assessment of performance, would rather ask questions about trustworthiness and confirmability than objectivity; about credibility and applicability than validity; about dependability and authenticity than reliability (Guba and Lincoln, 1989; Cambourne and Turbill, 1994; Gipps, 1994). In this model of assessment the teacher, as a human being, is seen as a responsive instrument, able to detect many nuances of performance from multiple sources, which no external, objective test can ever perceive. Compare this with the dominant paradigm which values external assessors over the teacher, testing over work requirements, written over oral, quantitative over qualitative, print over other text forms, and so on.

The knower is not distanced from the known
(both knower/mind and knowable/Nature)

Within both science and assessment, the dominant view is that the knower is distanced from the known, the relationship between the two 'is that between a subject and an object, radically divided, which is to say, no worldly relation.' (Keller, 1985, p.79) Hence, a corollary of the objectivity/subjectivity dualism is the desired separateness of the learner from the material they learn, and from the observer judging their learning. Yet we know that learners are not distanced from, but are formed by, their learnings, and that observers/assessors make decisions based on their understandings of what learners ought to be able to know and do.

Students arrive in our classrooms with prior understandings and conceptions that have been constructed over time through their unique interactions with their world. This is the basis of constructivism (Fensham, Gunstone and White, 1994) which is currently producing a revolutionary paradigm shift (Kuhn, 1970) in the teaching and learning of science. Girls and boys, as groups, generally have had very different out-of-school experiences which result in their school learning beginning at different starting points. Sometimes these prior experiences are assumed for all students and assessed accordingly, even though one group such as girls, may have had little opportunity to learn the skills, or about the phenomena, outside the classroom.

Because of prior experiences and constructions, assessment practices have commonly given an unfair advantage to particular groups of boys. For example it has been shown (e.g. R. Murphy, 1982; J. Harding, 1981, 1991; Blum and Azencot, 1986; P. Murphy, 1989; Gipps and Murphy, 1994) that many girls tend to do better in assessment tasks composed of structured and extended response questions, whereas boys, as a group, will do better if questions are posed in a multiple choice format. Thus, designing a test exclusively using a single question format would advantage one sex over the other, simply by the question format.

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Additionally, students bring gendered interpretations of their own success or failure. For example, causal attribution studies (e.g. Ames, 1984) show that when girls do well they often attribute their success to external factors such as luck, a good teacher or easy assessment tasks, whereas many boys attribute their success to internal factors such as innate ability. Constructions of gender also interact with self-perceptions of performance when boys tend to over-estimate strongly in mathematics, less so in English, whilst girls tend to be closer in estimation of their actual performance, but to underestimate more in mathematics than in English (Bornbolt, Goodnow and Cooney, 1994). Reliance upon any one particular assessment device, such as testing or self-assessment, will thus be open to the possibility of systematic sex discrimination.

Teachers also come to the classroom with prior experiences, assumptions and values with which they are constructing understandings about what they see as 'acceptable' feminine or masculine behaviours, for themselves and their students, and they also bring gendered perspectives on the way knowledge itself is organised. For example, when Spear investigated teacher blind marking of student work, the same pieces of work that were arbitrarily labelled as being done by either sex, she found that '...work attributed to a boy received higher mean ratings than the same work attributed to a girl.' (Spear, 1984, p. 373.)

Valerie Walkerdine goes further when she finds that 'girls are still considered lacking when they perform well, and boys are still taken to possess something when they perform poorly' (Walkerdine, 1989, p. 4). Walkerdine found that the girls often performed at least as well as the boys but the teacher's interpretation of their work was very different and unintentionally influenced by the student's sex. Teachers' gendered assumptions can be displayed in many ways such as when capacity judgments are based on future promise for boys/men and past performance for girls/women.

Thus three ways that assessment processes could privilege the masculine are: assuming equivalent out of school experiences for both sexes; assuming assessment techniques are gender-neutral forms of knowledge demonstration; being blind to gendered expectations which teachers bring to school. Recognising these interactions between the knower and the known would suggest that more equitable assessment would use: negotiation of starting points for learning; multiple data collection techniques; and a variety of assessors.

Multiplicity provides higher quality information
(both hierarchical and multiplicity)

Introducing multiplicity and variety into assessment practices can break down some past hierarchical patterns where particular assessors and types of data are considered more important than others. For example, a

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variety of assessors, including the student, a peer, the teacher, an external authority, can provide moderated authenticity, where there is an in-built checking mechanism against the gendered constructions of each assessor and the reports from each are all valued and moderated against each other. Students have a high level of personal engagement with their learning when it involves a degree of self management, (Hildebrand, 1991) although teachers need to remember that many girls under-rate themselves whilst many boys over-rate themselves (see Bornbolt, Goodnow and Cooney, 1994). Responsibility for learning can be shared and assessment is not done to students but done with students.

A second way that assessment can value multiplicity is to draw on a number of data collection devices which provide students with a range of opportunities to show what they know and can do. In establishing a fair and equitable assessment process that removes systematic disadvantage, a variety of assessment techniques are utilised and seen to be of equivalent importance and validity. Data collection devices may include: annotated timelines, concept maps, scientific posters, briefing papers, working models, investigative projects, simulation games, case study reports, photographic sets, audio/video tapes, observation checklists, journals, interview records, portfolios of class work, critiques of models/metaphors, anthropomorphic stories, etc. Similarly the products that are the outcomes of student assessment tasks should also vary in extent or length and in their forms: oral, written, visual, etc. This ensures that no particular mode is privileged over another.

Ideally, the students would negotiate the particular assessment formats that are used to assess their work. Negotiation means a 'letting-go' for the teacher of some of their power and control of the learning/teaching/assessment system.

Valuing values
(always value-driven)

There can be no such thing as value-free gender constructions, value-free science or value-free assessment. Our values are implicit in the choices we take. The simple act of choosing to prioritise abstraction, objectivity, quantitative approaches, hierarchies, competition, outcomes, and to desire freedom from values, is making a value judgment. Constructing assessment practices upon such a biased set of concepts generates gendered achievement profiles and cannot be valid, that is 'equally fair and sound for all groups' (Gipps and Murphy, 1994, p. 2).

'It is through our assessment that we communicate to our pupils those things which we most value.' (Clarke, 1988, preface.) If we value: qualitative understanding; formative assessment to improve learning;

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synthesis and holistic learning in a social context; explicit criterion referenced assessment; cooperation; variety in sources of evidence upon which to make judgments; and variety in assessors; then we must value 'both/and' thinking when considering the dualisms which underpin our assumptions, our curriculum policies and our assessment practices.

A change opportunity: the Victorian Certificate of Education

The Victorian Certificate of Education (VCE) had a long gestation, and painful birth, but has been in place now for over five years. It is used as a schooling completion credential and as a means for competitive selection into limited tertiary and workforce places. It is thus a critical and publicly accountable stage of schooling and the potential for a paradigm shift at this transition phase appeared more possible than at any other phase of schooling. The story of interrupting gendered achievement profiles in the VCE is interwoven with the action of the McClintock Collective, a network of educators in Victoria, who have been working together on gender and science education since 1983.

The McClintock Collective took up the development of the new VCE courses as a site of political action and a vehicle of challenge to the conventional paradigms of science, gender, curriculum, teaching and assessment. There was a deliberate, yet subtle and effective, campaign of the Collective to be represented on all committees having an influence on the new courses. Thus people with a strong background in gender and science became instrumental as course writers, advisers, textbook authors and monitoring committee members. Women such as Christina Hart (who was instrumental in the physics changes discussed here), Bev Dick, Dorothy Kearney, Sue Lewis, Michelle Livett, Anne Gooding, Kerry Mullins, Lucy Cirona, Dianne Peck, myself. These women struggled as the 'other'. Outsiders who were often seen as (and were) infiltrators representing an attack on the hegemonic paradigm of the 'real' science curriculum and assessment: the one that had well served the interests and needs of males across generations.

The changes to the VCE began with a widely held conceptualisation which centred on a notion of 'gender inclusive' curriculum that included all those dimensions that contribute to the construction of gender in schools - providing ways for teachers and students to actively engage in negotiating, resisting and interrupting processes that assume gendered boundaries. Whilst the new VCE could not alter all possible facets, the feminist advocates on the committees did focus on the curriculum, instruction and assessment practices that were under the locus of control of the central accrediting body.

I do not want to give the impression that all McClintock Collective members work from a single frame of reference, or are even united in their vision of science or in their quest for a more gender equitable system of assessment. There are members who would see their primary

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goal as an increase in the participation rates of young women in science courses and careers. Any changes which will facilitate access into science, and equity within its current construction, are considered worth pursuing. These women are looking through a liberal feminist lens, and are trying to skill up girls so they can do science, and assessment tasks, that are abstract, analytical, objective, rational, quantitative, competitive, and focus student effort on the end result, usually access into tertiary science courses.

Yet many other McClintock members, probably the majority, are actively working towards creating a new construction of science, at least in schools, in which

> the values traditionally ascribed to women are given a positive and central place ... and there is a ... belief that the quality of life has priority over economics or efficiency or 'rational' planning ... [where] scientific activities ... reflect a balance with and not an exploitation of nature ... [and there is] an alteration of world view... from the analytical fragmentation of modern science to a holistic view in which social, ethical and moral considerations are unquestionably involved ... [where the] scientific community [is] based on co-operation, social accountability and accessibility and ... a respect for and equal valuations of different forms of knowledge, including the 'irrational' and the 'subjective'.
> (Manthorpe, 1982, p. 75)

Looking through this lens, the development of 'McClintock' approaches can be seen as radical feminist: celebrating the feminine and women's ways of relating to the world. The concept of a 'pedagogy for girls in science', has become the major focus of the work of the McClintock Collective, although the term pedagogy is not used. Whilst it is still unclear what feminist pedagogies might be, speculation on them is becoming more focussed as a central concern of feminist educators (e.g. Shrewsbury, 1987; Roy and Schen, 1987; Gore, 1992; Luke and Gore, 1992) and influencing the work of the Collective, which has largely grown out of the 'personally relevant pedagogy' (Hollingsworth, 1992, p. 384) of its active members. Many strategies and practices (e.g. Gianello, 1988; Lewis and Davies, 1988; Hildebrand, 1989) have been advocated in extensive professional development programs as a means of making a new version of science accessible to girls. The aim could be read as enabling girls to learn, and enjoy, a new science in ways more appropriate to meet their needs, interests and concerns. McClintock members using this frame of reference highly value: multiplicity, synthesis, holistic learning, qualitative understandings, cooperation, intuition and subjectivity and try to build these into assessment practices.

The namesake of the Collective practised science herself in a manner which deviated from the masculine norm: Evelyn Fox Keller (1985) quotes Barbara McClintock as saying: 'There's no such thing as a central dogma into which everything will fit' (p. 162). Fox Keller goes on to argue that

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McClintock's work shows science the fruitfulness of a 'respect for difference [which] remains content with multiplicity as an end in itself' (p.163) rather than a constant pursuit towards an ordering of the world based on dualisms - an ordering typically excluding or diminishing one side of the pair.

Respect for difference and multiplicity has become a guiding principle in the work of many McClintockers (a short-hand term used by members of the Collective). Multiple sites of political action; multiple forms of feminism, depending on the context and audience of the action; multiple goals for changing science and teaching, not always directed at increasing girls' participation in science; multiple pedagogical practices that may meet the needs of some girls and teachers some of the time; and multiple starting points for teachers interested in addressing gender issues in their classrooms. Thus McClintockers work on multiple fronts to deconstruct the restrictive and dysfunctional dualities of gender and of science. In that sense, a glimpse through the post-structural feminist lens, is available within the Collective's work.

However, most McClintock Collective work has centred on the 'development and "dissemination" of alternative forms of non-discriminatory and empowering pedagogy, which may challenge schooling's complicity in reproducing gendered inequality' (Kenway and Modra, 1992, p. 141). The manifest ways of doing this, and the frames of reference of the viewers/actors are in a constant state of flux, and are characterised by their very fluidity and flexibility. Whilst very little direct analysis on the impact of this work has been undertaken, the publicly available outcomes of the new VCE are, at least to some degree, a measure of the success of the Collective's work.

Lessons from physics

Whilst the pattern of assessment practices outlined here are common to all the VCE subjects, physics is chosen as a barometer because of its extreme position as the science subject most closely aligned with 'hegemonic masculinity'.

The opportunity that the introduction of the VCE created, provided two catalysts to speed up the implementation of McClintock pedagogies. Firstly, there was much professional development time for VCE teachers that the Collective organised. Secondly, the study designs incorporated assessment approaches, advocated by McClintockers, which necessitated changed classroom practice. Thus we were able to build in integrated, formative work requirements and assessment tasks, with explicit guidelines and criteria, which valued qualitative understanding, assessed all course goals, were set in a real world context, required a variety of types of data sources, and using different assessors. An example of new data sources illustrates: teachers who had never considered the 'visual' as a legitimate way of summarising learning were required to ask students to submit a poster on

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their research (in physics) or produce a concept map of ideas (in chemistry).

A distinguishing feature of the new assessment processes is the embedding of continuous formative assessment into the learning program through a two tier system of 'work requirements' and 'common assessment tasks'.

Work Requirements:

The work requirements are designed so that by doing these tasks at specified points during their studies, students would, almost necessarily, learn the intended curriculum. In physics, each of the four semester units studied consecutively across the last two years of secondary school, require the satisfactory completion of six or seven work requirements. Students are given specific guidelines on how to complete the work requirements which '... place emphasis on the interaction between physics, technology and society.' (VCAB, 1991a, p. 3), with some flexibility to negotiate real world contexts to match students' interests. The new course values different learning approaches and thus the work requirements provide a range of ways for students to show evidence of their learning. For physics these include: posters; case studies; student-designed practical investigations, research projects; and files of changing ideas. Physics was no longer assessed only by multiple choice test items!

Common Assessment Tasks (CATs)

Common Assessment Tasks (CATs) are the basis for judging the quality of the work done in the last two semester units, usually undertaken in the final year of school. All students across the state doing a subject do the same three or four CATs and it is these grades that are used for tertiary selection. In every subject, at least one CAT is assessed internally by the teacher and at least one is assessed under test conditions by external examiners. For the new physics course, CAT 1 and CAT 3 were teacher assessed and CAT 2 and CAT 4 have been completed under test conditions. Also the CATs are spread across the year, so that student achievement is monitored at different points and on qualitatively different types of tasks. For physics, the two teacher-assessed CATs were an extended practical investigation, due in May and a research project due in September. The two external test CATs are a comprehension and application test at the end of first semester (June) and an explanation and modelling test at the end of second semester (November). Both tests require extended response answers in some sections (i.e. not only multiple choice questions as had been the previous practice for physics examinations).

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Social Context:

The tenet that theory and practice should be explicitly linked and therefore learning of curriculum skills and content must be set within a social context became one of the strongest guiding principles for all VCE courses in all discipline fields. The physics curriculum 'is based on the view that learning takes place in the same way physics itself is practised: in a social setting, trying to make sense of problems which matter to people.' (VCAB, 1991b, p. 8). As assessment issues are central to the whole curriculum design process, they also incorporate physics in its social context. This is a distinguishing feature of the new physics course. One of several specified contexts had to be selected as the vehicle for learning the central physics ideas. For example the contexts for the topic, Movement are: 'Aristotle to Newton and beyond', 'On your own two feet' or 'Wheels'. For Nuclear Energy they are 'Development of the bomb' or 'Nuclear power'. Students, individually or in small groups, choose a context for each topic that is of personal interest.

The new assessment tasks are situated within a context which provides 'a point of connection with students' intuitive perceptions of the world' and which uses 'students' ideas as starting points for learning experiences.' (VCAB, 1991b, p. 11). For example, the research project, or CAT 3, had to be presented in the form of a scientific poster, and the specifications stated that it must examine one of the following:

- everyday situations (e.g. sailing, bicycles, ballet)
- physics related to other forms of knowledge (e.g. biophysics, geophysics)
- issues of social or personal importance (e.g. safe road design...)
- development of ideas in physics... making reference to social and/or technological implications
- technological applications (e.g. lasers, jogging shoes, electrocardiograms)
- the work of physics related laboratories, industries or professions (e.g. ... designing and manufacturing sound systems, physiotherapy) ... (VCAB, 1991a, p. 35.)

That is the research project must be physics set in a social context.

Even in the externally assessed test CATs, social context is important. For example, students can choose to study Sound through one of three contexts: 'Speaking and hearing', 'Music making' or 'Recording and reproduction'. The test questions are arranged so that students select the set for their chosen context. The following items appeared in equivalent sets, accompanied by relevant diagrams and related questions, in the second CAT, the comprehension and application test, for 1993:

> 11. If the dinosaur had vocal cords in its throat which generated sound over a wide range of frequencies, explain the effect of the

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> **length** of the nasal cavity on the sound emitted by the dinosaur. (Board of Studies, 1994, p.9)
> 11. A wide range of frequencies is emitted by the sound-tube toy, but only a few frequencies are audible in the emitted sound. Explain the effect of the **length** of the tube on the sound emitted by the sound-toy. (Board of Studies, 1994, p.11)
> 11. The background noise in the museum is made up of a wide range of frequencies, but only a few frequencies are audible in the sound emitted by the set of tubes. Explain the effect of the **lengths** of the tubes on the sound emitted by the sound exhibit. (Board of Studies, 1994, p.13)

These items also show how qualitative understanding is now also expected, alongside the quantitative questions (not shown here) for each set.

Criteria

Each Common Assessment Task has clearly stated criteria that are used to distinguish between achievement levels and hence determine the grades on a scale. Three of the nine criteria for CAT 3, the research project, have been: 'The extent to which the report ... explains and discusses concepts through: synthesis and integration of relevant ideas; communication of the understanding gained; identification of related technological and social issues.' (VCAB, 1991a, p. 38). Not only are the desired skills specified but they include ones which have not previously been valued in physics marking schemes in Victoria.

New teaching approaches

An example of one new teaching strategy used in the Nuclear Energy topic is 'a role play of people at a public meeting held to decide if a nuclear power plant should be built in the area.' (VCAB, 1991b, p. 15). Teachers now also use brainstorming, creative writing, jigsaw techniques for co-operative learning and other McClintock Collective teaching strategies (see Gianello, 1988, Lewis and Davies, 1988, Hildebrand, 1989). In the Year 11 topic, Nuclear Energy, those students who have chosen the context, 'Development of the bomb', can complete one work requirement with a briefing paper that responds to a focus statement such as: 'A group of students from your school is visiting Japan on a study tour, and one of the places they will go to is Hiroshima. They ask your physics class to prepare some information for them on the physics of the atomic bomb and its effect on people.' (VCAB, 1991b, p. 24). Many other focus statements for this briefing could also be negotiated with students. The quite radical shift in the conceptualisation of learning built by the work requirement system means it is no longer possible to teach physics in the old ways.

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Assessment matching the course aims

Three of the ten aims in the new physics course are:

- become aware of physics as a particular way of knowing about the world which interacts with the setting, both social and personal, within which it is pursued;
- understand some of the practical applications of physics in present and past technologies, examining the social usefulness of such technologies as well as problems associated with them;
- develop the capacity and confidence to communicate their knowledge of physics effectively (VCAB, 1991a, p.1-2)

A genuine attempt has been made to ensure that these are built into the assessment program: the first is highlighted in the work requirement where students have to build a file of changing ideas about light and matter; the second in the research project (CAT 3) and the third in both the extended investigation, (CAT 1) and in CAT 3.

How has the assessment transformed the curriculum?

The actual physics curriculum statement is not markedly different from that in other similar level courses. It includes: light, heat, sound, electricity, electronics, motion, forces, structures, radioactivity and nuclear energy, etc. The difference here is that the integrated assessment processes created by the formative work requirement system necessitated new approaches to curriculum implementation. For example, in order to enable students to satisfactorily complete the prescribed work requirements, teachers were required to base all the central ideas in real world contexts. Also, as the work requirements demand a range of learning tasks, a broader repertoire of teaching strategies must be employed. The guidelines and criteria are explicit for each assessment task which now value qualitative understanding as well as quantitative ability; and, together, the assessment tasks cover all the course goals. These changes have meant that girls experience a physics curriculum which is very different from that of the old course.

Has this interruption altered outcomes for girls?

Looking through an access and equity or liberal feminist frame of reference, an analysis of girls' participation and achievement in physics can now be undertaken.

Participation of girls in physics

In 1970, 16 per cent of all girls and 49 per cent of all boys studied physics in Year 12. (See Note 1). By 1985 this had declined to 8.9 per cent of girls and 34.8 per cent of boys. This pattern continued for the final years of the old course. But for 1992, the first year of the full new course, the proportion of girls increased with 9.4 per cent of all girls choosing the

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new physics course while the corresponding figure for boys continued to decline to 28 per cent of all boys. By 1994, physics educators were concerned about the overall drop in physics participation, down to only 7.8 per cent of all girls and 26.9 per cent of all boys; but this occurred at a time when the overall retention rate had increased, suggesting that the extra students who now stayed on to complete their VCE were not taking up physics. Many more boys than girls are studying physics, but the new course has made a small shift in the participation of girls given that 53 per cent of the cohort are now girls.

Achievement

a) Satisfactory Completion or Passing Grades

All items on the external exam of the old physics course (which dominated the grading system through being used as a tool to moderate teacher assessments) were dichotomous response: either multiple choice or numerical answers. Between 1970 and 1985, the percentage pass rate for boys in Year 12 physics was consistently greater than 3 points above that for girls. When the research clearly suggested that this examination format might discriminate against girls, some extended response and social context questions were included in the papers at the end of the eighties. This did have an impact on the overall success rate of girls so that by 1991 (the last year of the old course) 87 per cent of girls and 84 per cent of boys passed.

With the new VCE physics in 1992, 97 per cent of girls satisfactorily completed, whilst 94 per cent of boys did so. This 10 per cent increase in one year suggests that the work requirement system is more accessible and equitable for all students. These completion rates have remained high for both girls and boys, with a slight edge in favour of girls. This edge could be explained by the more select group of girls who choose to study physics

b) Mean Scores:

Because of the way data was retained for the years before the introduction of the VCE it is not possible to calculate mean scores for girls and boys on the old course. However it is reasonable to assume, because of the outstanding degree of difference in passing rates and A-grades awarded, that mean scores for boys were greater than those for girls. Cox and Nash (1994) have analyzed the first two years of VCE physics data and show that the mean scores of girls have been better than those for boys at statistically significant levels ($p = 0.01$). They further analyzed the data for each Common Assessment Task (CAT) and found that girls' mean scores were greater than those for boys at statistically significant levels across all CATs ($p=0.001$ for all but the first test, CAT 2, in 1993 where $p=0.01$). In 1995 and 1996 the girls mean

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scores were higher than the boys in each CAT and overall for the subject.

c) Excellence:

Another dramatic impact of the changes in physics is in the sudden capacity of girls to demonstrate 'excellence' as is evidenced in the awarding of A-grades.

Under the old system, from 1970 to 1985, the percentage of boys awarded A-grades was consistently more than 8 points higher than the corresponding figure for girls. For example in 1985, 11.5 per cent of girls were awarded A-grades whilst 20.7 per cent of boys were so rewarded. This gave fuel to the argument that girls just could not do physics very well! With the advent of the new extended response and social context questions in the exam, the margin narrowed so that by 1991, the last year of the old course, there was only a difference of 4 points, still in favour of boys (14.3 per cent of girls and 18.1 per cent of boys received A-grades).

The remarkable change in the A-grades awarded for the Common Assessment Tasks in the VCE (see Table 1) indicates that suddenly girls have become brilliant at physics!

As can be seen in Table 1, girls achieved excellent results in all the physics CATs and were only outperformed, in the awarding of A-grades, by the boys in CAT 2 (1993, 1994, 1996) and CAT 4 (only in 1993), although girls' mean scores overall, and on each CAT, were still better than those for boys (Cox and Nash, 1994). In particular, for the two internally (teacher) assessed physics CATs, (CAT 1 and CAT 3) the girls' results were considerably better than those for the boys with almost half the girls being awarded A-grades for their research projects (CAT 3). Whilst both sexes improved on these two internally assessed CATs in 1993, the gap between them widened from 1992 to 1993 and remained fairly steady for 1994. This confirms the work done in Western Australia by Rennie and Parker, (1991), which showed that girls achieved better results on internal assessments than did boys.

The changes in assessment practices have lead to an educationally important transformation in girls' experience of, and success in, the physics curriculum. The data suggests that the assessment processes are now more equitable: girls are a very select group and it ought to be expected that they would outperform boys. Girls' mean scores were greater than those for boys in all but two Common Assessment Tasks - the two test CATs in chemistry - across all five science subjects (Cox and Nash, 1994); and over the full range of forty-four studies within the VCE girls consistently outperformed boys. Looking through the liberal feminist lens, it would seem that the changes to the VCE have been good for girls.

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Table 1: Excellence defined by A-grades in VCE physics

Common Assessment Task (CAT)	Girls awarded A-grades (per cent)	Boys awarded A-grades (per cent)	Diff (G-B) (per cent)	Mode of Assessment
CAT 1				
1992	27	19	**8**	internal
1993	40	26	**14**	experimental
1994	44	29	**15**	investigation
1995	52	36	**16**	
1996	52	38	**14**	
CAT 2				
1992	17	17	**0**	external exam-
1993	15	17	**-2**	comprehension
1994	15	17	**-2**	& application
1995	22	21	**1**	
1996	20	22	**-2**	
CAT 3				
1992	36	28	**8**	internal
1993	44	30	**14**	research project
1994	43	29	**14**	
ceased				
CAT 4				
1992	18	16	**2**	external exam
1993	15	16	**-1**	explanation &
1994	16	15	**1**	modelling
now called CAT 3:				
1995	23	21	**2**	
1996	22	21	**1**	

Why do girls achieve better grades with the VCE?

I recorded the following reactions, which were given by unidentified science teachers at the workshop on 'CATs and Sex' run by Peter Cox and Mary Nash (Cox and Nash, 1994), in response to: 'Why do girls do better, especially on the teacher-assessed CATs?'

> Girls choose physics, but boys get told to do it.
> Girls are a more select group, ability-wise.
> Girls are more careful and they read the assessment criteria.
> Girls ask the teacher what the criteria mean.
> Girls put in a draft and get feedback.
> Boys tend to be 'slap-dash' in their submissions.

Some of these answers reflect a view through the radical feminist lens, extolling the qualities which young women bring to their study of physics. One of the physics curriculum specialists (Firkin, 1993) places much of the credit for the shift in achievement profiles to the style of

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assessment which 'does seem to allow girls to show what they know and what they can do much better than the old system'. She also suggests that the first physics CAT, the internally assessed, extended experimental investigation, has a confidence boosting effect for girls which continues into the test CATs. Firkin stresses that the course itself is no less rigorous or difficult.

Girls apparently do '... respond better to science if more co-operative and interactive modes of learning ... [are] part of the pedagogy' (Tobias, 1990. p. 70). While there are grounds for celebration, a number of concerns remain.

Good for all girls?

Using the liberal feminist and the radical feminist lenses these changed assessment practices could be said to have been good for girls. But looking through the post-structural feminist lens we see the need to recognise the many differences within the broad category 'girls' and see that the interactions based on socio-economic factors and ethnicity, at least, challenge claims that all is well.

Some research, (e.g. Jones, 1989; Wyn, 1990) suggests that girls from lower socio-economic backgrounds actively resist instructional and assessment practices based on 'interpretation, exposition and independent work' (Jones, 1989, p. 29), precisely those practices which are now being given greater status. Teese et al (1994) clearly show that not all girls are doing well in the new VCE. Their data shows that both in enrolment patterns and achievement levels, girls from low socio-economic areas are well behind girls from areas with higher proportions of the population having tertiary qualifications and higher status occupations. For example: the 1992 participation rate of girls in physics for the working class north-west region of Melbourne was less than 7 per cent compared to 12 per cent of VCE girls in the more affluent inner-eastern region. The differences are even more dramatic when achievement is considered: in 1992 less than 14 per cent of girls from the north-west region gained high grades (defined as in the top 20 per cent) whereas 39 per cent of girls who lived in the inner-eastern region did so (Teese et al, 1994).

Other evidence also suggests that some girls suffer pressure and trauma caused by teachers who expect girls to live up to the prejudices that their teachers have of them as belonging to particular ethnic categories. For example, Chinese-Australian girls who do not like, and are not highly competent at mathematics and science, are treated negatively by many teachers who believe they should fit an unrealistic stereotypical pattern (Fan, 1994).

The current curriculum and assessment changes are obviously not broad enough in scope to ensure effective pedagogies for all girls and all boys. A way forward might be to build in more negotiation of

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curriculum content and assessment processes, within broad parameters which maintain 'public credibility' (Gipps, 1994, p. 173) in the entire credentialling process, whilst allowing for differences in interest, learning styles and preferred assessment modes to cater for distinct groups of students.

Two steps forward, one step back

During 1994, a General Achievement Test (GAT), basically a conventional 'aptitude' or SAT-type test, was introduced and all teacher-assessed CATs are now statistically moderated by it. The GAT creates several educational concerns: the presumption that external ('content-free') tests are more valid than teacher assessments; the validity of assuming that performance on qualitatively different types of tasks can be compared; the degree of inclusivity of the GAT for ethnicity, race and socio-economic factors as well as for gender; the performance differences on the GAT which are driven by the format chosen (predominantly multiple choice); and the removal of the powerful professional development experiences which occurred while teachers shared ideas during their previous Verification Days which had been used to moderate teacher assessments.

Girls have done very well on the internal, teacher- assessed tasks. However, changes to the Physics study design from 1995, have meant the deletion of the research project, CAT 3 (in an effort to reduce student workload only three CATs remain for each subject), the very CAT which allowed girls to shine! (Remember almost half of girls were awarded A-grades in the research project up until 1994!) This means that from 1995, two thirds of the physics result has come from test CATs, whereas previously the new course had half the final assessment derived from teacher-assessed CATs. Another change, from 1995, which was expected to be detrimental to girls, is the removal of the obligation for teachers to present all learning within a social context and the subsequent optional place of context in the test CATs. That is, physics could have gone back to 'a point mass moved at 3m/s across a frictionless surface...' A cynic might comment that the men, back in power on the physics committee, had taken the opportunity to re-assert their dominant paradigm of assessment which privileges boys! However, as the data shows (See Table 2), this setback has not altered the dominance of girls over boys in physics. Girls still achieve more A-grade scores than boys and their mean score for physics is still higher than that for boys. It seems that the shift in teachers minds over how physics ought to be taught and assessed remains: the curriculum practice has lived up to the gender inclusive policy of the new course structure.

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Table 2: Physics Mean* Scores for each CAT and overall, 1995/6

	Girls' mean (%)	Boys' mean (%)	Difference (Girls- Boys) %
1995			
CAT 1	81.7	73.5	**8.2**
CAT 2	62.5	58.6	**3.9**
CAT 3	64.5	59.8	**4.7**
overall	69.5	63.9	**5.6**
1996			
CAT 1	82.4	55.9	**26.5**
CAT 2	60.8	59.9	**0.9**
CAT 3	64.4	60.5	**3.9**
overall	69.1	58.8	**10.3**

* The mean scores were calculated by assigning A+ = 10, A = 9, B+ = 8, B=7, etc down to UG = 0.

Conclusions

A policy change driven by the desire for a gender inclusive curriculum and associated assessment practices has meant that a twenty year bias in assessment, in favour of boys, was turned around in physics in Victoria, Australia. Consistent with the arguments at the beginning of this paper, McClintockers have been able to make considerable shifts in the balance within each pair of gendered dualisms which underpin assessment. Simple changes that meant a valuing of "both/and" concepts underpinning conceptualizations of good assessment practices meant that a wider variety of learning activities, skills and tasks were valued by becoming part of the "work requirement" and "common assessment task" format for the VCE. No longer is achievement based only on examinations made up of decontextualized assessment tasks. Unlike tertiary physics courses, VCE physics now presents scientific knowledge not as an objective or universal truth, but as a social construction grounded in our complex world. There is now a firm commitment to multiplicity as a way of resolving some subjectivity issues and a recognition that assessment is a value-laden activity. The struggle to do this was never easy. The result: girls now excel at physics in Victoria.

Despite these shifts, the following dualisms are still evident in the new physics curriculum and assessment practices:

abstract	holistic
quantitative	qualitative
outcomes	process
competition	cooperation
knower/mind	knowable/Nature.

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Whilst both columns are now recognised as having something to offer the study of physics, the term on the left is still given a higher status over its partner. There is much to be done before these dualisms are fully challenged as the ideological foundation of assessment (or for that matter, gender and science), but even the small shifts that were possible have interrupted previous performance patterns.

As Connell et al (1992) state 'assessment practices are not technical devices which are socially neutral, but social techniques that have social consequences.' (p. 23). By selecting particular assessment tasks and techniques we are giving clear messages to students about what is valued as knowledge and which ways of learning are rewarded. To premise our choices on an ideology which privileges the masculine is to build a fundamentally flawed system which will produce gendered achievement profiles. In working towards effective curriculum for all students we must look through the post-structural feminist frame of reference to deconstruct and interrupt the implicit gendered dualisms which act as powerful stabilisers of current paradigms. Only then can we re/construct curriculum and assessment policies and practices that are genuinely inclusive. And as this paper has shown, changed outcomes for students can be the direct result of this re/construction.

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Notes:

1. Statistics in this paper came from: VCAB (1992, 1993), VBOS (1994, 1995, 1996, 1997), Hildebrand (1987), Firkin (1993) unless attributed to other sources.
2. VBOS is the Victorian Board of Studies (established 1993)
3. VCAB was the Victorian Curriculum and Assessment Board.
4. VCE is the Victorian Certificate of Education.
5. CAT is a Common Assessment Task.
6. GAT is the General Achievement Test.
7. A version of this paper has appeared as Hildebrand, G. M. (1996) Redefining Achievement, in Murphy, Patricia and Gipps, Caroline (Eds) Equity in the Classroom: *Towards effective pedagogy for girls and boys*. London: Falmer Press. Pp 149-172

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